

# BEST AVAILABLE COPY

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau



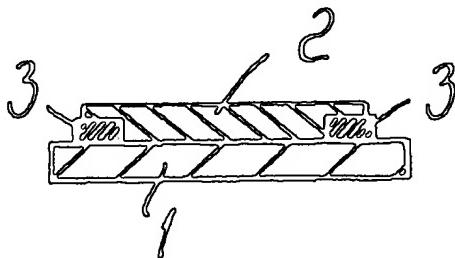
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> :  H05B 3/84		A1	(11) International Publication Number: WO 99/62303  (43) International Publication Date: 2 December 1999 (02.12.99)
(21) International Application Number: PCT/EP99/03627		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 26 May 1999 (26.05.99)			
(30) Priority Data: PD98A000134 28 May 1998 (28.05.98) IT			
(71) Applicant (for all designated States except US): ISOCLIMA S.P.A. [IT/IT]; Via Alessandro Volta, 14, I-35042 Este (IT).		Published With international search report.	
(72) Inventors; and			
(75) Inventors/Applicants (for US only): MANFRE', Giovanni [IT/IT]; Via Roma, 6, I-37042 Caldiero (IT). MIRANDOLA, Andrea [IT/IT]; Via Minorello, 4, I-35042 Este (IT).			
(74) Agent: MODIANO, Guido; Modiano & Associati, Via Meravigli, 16, I-20123 Milano (IT).			

(54) Title: HEATED MIRROR, PARTICULARLY FOR VEHICLES, AND METHOD FOR MANUFACTURING IT

(57) Abstract

A heated mirror, comprising a glass body (1) on one face whereof a film of an electrically conductive metal (2) is deposited so as to form an actual reflective surface. Two conductive busbars (3) are associated with the film (2) made of electrically conductive metal and are suitable to allow the flow of an electric current in the film (2).



BEST AVAILABLE COPY

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

## HEATED MIRROR, PARTICULARLY FOR VEHICLES, AND METHOD FOR MANUFACTURING IT

### Technical Field

The present invention relates to a heated mirror.

- 5 Its most widespread but not exclusive applications are in the automotive field and in the field of transportation in general as rear-view mirrors.

### Background Art

- Rear-view mirrors manufactured with conventional technologies in fact are affected, especially during the winter period, by the inconvenience of 10 misting or, worse still, frosting and icing on their external surface.

In such conditions it is absolutely impossible for the driver to drive away with his vehicle; the driver is accordingly forced, in many cases, to resort to the use of mechanical means, such as scrapers, to defrost the mirror until he clears all (or at least most) of the reflective surface.

- 15 Actually, conventional heated mirrors are currently widely used which are obtained starting from a glass plate having a suitable geometric shape, even a curved one (with a cylindrical, spherical or aspheric configuration) to which a reflective layer (usually made of silver, chromium, aluminum or oxide-metal films) is applied at the rear or front part; a resistive element is 20 fixed to said layer by means of an adhesive film.

The resistive element substantially consists of a coil formed by an electric conductor which is applied to the rear of the reflective surface and has, at its ends, terminals for connection to an electric power source.

- Accordingly, it is sufficient to connect said terminals of the resistive 25 element to the power supply to achieve the flow of a current whereby heat is generated due to the Joule effect.

However, such heat generation is not perfectly uniform and therefore the mirror is heated by means of a transmission of the heat by conduction from the resistive element that generated it, through the reflective surface and the 30 glass layer, to the external surface to be demisted or defrosted or deiced.

Accordingly, it is necessary to supply adequate electric power to the resistive element for a certain time in order to produce the gradual heating of the entire volume of the glass.

It should be observed that the reflective surface does not have per se  
5 particular conductive characteristics and is unable to independently generate the heat required to demist the mirror; said heat must instead be supplied by the resistive element.

The reflective layer, regardless of its position (at the front or at the rear), can actually be a hindrance to the flow of heat: it is in fact an interface  
10 which has different physical characteristics with respect to glass, and it is necessary to take this additional layer into account as regards heat transmission.

For an equal level of supplied electric power and of dispersed heat flow, the heating time is therefore obviously longer with respect to a system  
15 which has no additional layers between the heating system and the surface to be heated.

Moreover, the heat generated by the resistive coil can, over time, degrade the characteristics of the adhesive of the film, no longer ensuring good thermal contact between the glass and the conductive film; accordingly, the  
20 efficiency of the entire heating system can be compromised and degraded over time.

#### Disclosure of the Invention

The aim of the present invention is to provide a mirror which allows to perform defrosting and/or demisting in a time which is not longer than  
25 achieved with conventional mirrors.

Within the scope of this aim, an object of the present invention is to provide a heated mirror which is capable of ensuring excellent viewing of the reflected image and, in case of strong lighting, for example in the presence of headlights, better visibility than conventional mirrors.

30 Another object of the present invention is to provide a heated mirror

which ensures good heating uniformity on the entire surface thereof.

A further object of the invention is to provide a heated mirror which can be manufactured in a shorter time than conventional models and by means of simpler and quicker assembly steps.

5 A further object of the invention is to provide a heated mirror which can be manufactured at very low costs.

A further object of the invention is to provide a heated mirror which allows to vary the coloring of the reflective surface thereof.

10 A further object of the present invention is to provide a heated mirror which ensures a longer life time than conventional mirrors.

A further object of the invention is to provide a heated mirror in which deterioration of the reflective surface caused by the action of weather is prevented.

15 A further object of the present invention is to provide a heated mirror which ensures good electric and optical characteristics over time.

A further object of the invention is to provide a heated mirror which can operate even with very low temperatures (down to -50°C).

20 A still further object is to provide a heated mirror which has a lighter structure than conventional models and at the same time has a higher mechanical strength, thus reducing the risk of breakage due to impact.

This aim, these objects and others which will become apparent hereinafter are achieved by a heated mirror, according to the present invention, characterized in that it comprises a glass body on one face whereof a film of an electrically conductive metal is deposited so as to form 25 an actual reflective surface, two conductive busbars being associated with said metal film and being suitable to allow the flow of an electric current in said film.

#### Brief description of the drawings

Further characteristics and advantages of the present invention will 30 become apparent from the description of a preferred embodiment, illustrated

in the enclosed drawings wherein:

Figure 1 is a sectional view of a first embodiment of the mirror according to the invention, with the heating coating applied on the glass body of the mirror, at the side whereon the rays of light are directly incident;

5      Figure 2 is a sectional view of a second embodiment of the mirror according to the invention, with the heating coating applied on the glass body of the mirror, at a side which is opposite to the one whereon the rays of light are incident;

10     Figure 3 is a cross-sectional view of the mirror according to the invention, with the conductive elements arranged according to a first embodiment; and

Figure 4 is a cross-sectional view of the mirror according to the invention, with the conductive elements arranged according to a second embodiment.

15     Ways of carrying out the invention

A heated mirror according to the present invention comprises a glass body 1 which in this case has a planar structure and which, in this constructive solution, has a reduced thickness of approximately 1-2 mm.

20     The planar glass body 1 can be conveniently curved with currently used methods in order to obtain a mirror which has a cylindrical, spherical or aspheric shape.

At the rear face of the glass body 1 two conductive busbars 3 are provided, of a per se known type, obtained by means of a per se known screen-printing process, using silver paste in this case.

25     The screen-printed silver paste that constitutes the pair of busbars 3 is preferably dried by means of a thermal treatment in order to improve the adhesion thereof to the glass body 1.

In other equivalent constructive solutions, different materials can be employed to obtain the two busbars 3, provided that they have adequate 30 characteristics.

In particular, it is possible to use materials which do not require a thermal treatment for drying.

A coating surface 2 is delimited, by masking the complementary surface, according to per se known treatment methods, on the same rear face of the 5 glass body 1 on which the conductive busbars 3 have been screen-printed.

Thereafter, the glass body 1 is placed inside a deposition chamber, of a per se known type, in order to deposit onto the rear face thereof a thin titanium film 2 which thus constitutes the actual reflective surface of the mirror.

10 Preferably, the thin titanium film 2 is deposited according to a technique commonly known as Vacuum Arc Deposition.

As an alternative, it is possible to use other different deposition techniques for the titanium film, for example those known as DC Magnetron Sputtering, CVD, etcetera.

15 In this embodiment, the thin titanium film is a single layer.

In other embodiments it is possible to deposit other equivalent conducting materials (silver, aluminum, etcetera) instead of titanium.

The two conductive busbars are meant to constitute electrodes of the heated mirror; for this purpose, they are welded to conducting terminals 20 (preferably made of copper or silver) in order to allow connection to an electric power source, which can be, very simply, the battery of a motor vehicle.

It is then necessary to spray a paint or, as an alternative, apply a suitable material on the coated rear face of the glass body 1, in order to form a 25 protective layer so as to ensure its stability over time and thus prevent any oxidation and degradation of the final metallic layer.

The protective layer can be composed of multiple layers of different materials in other embodiments.

It can also be rendered externally adhesive in order to allow a good 30 bonding with a plastic support of the type commonly used in conventional

mirrors.

In particular, the protective layer must also conveniently insulate the welding regions between the terminals and the conductive busbars in order to prevent the generation of electrical discharges if water is present.

5      The glass body 1 is then placed in a controlled environment (i.e., in an environment wherein the relative humidity, the temperature and all the other environmental conditions are kept within preset limits) so that the protective layer of paint dries.

10     The heated mirror thus obtained is characterized in that the pure titanium film constitutes the reflective surface and simultaneously acts as a resistive element, since after the appropriate connection of the two conductive busbars 3 to the electric power source it allows the direct flow of an electric current and accordingly generates heat by means of the Joule effect.

15     The heat can then be transmitted directly toward the front face of the mirror, since there is no interposed material that slows its transmission.

Moreover, the heat is practically unaffected by any dispersion from the rear face of the mirror 2 toward the outside environment thanks to the presence of the layer of protective paint, which also acts as a heat insulator.

20     Directly after the deposition of the titanium film, it is possible to superimpose thereon other titanium-based films, particularly titanium nitride and titanium oxide films, by means of successive depositions, simply by introducing nitrogen and oxygen in the deposition chamber.

By appropriately combining the films a heated mirror is obtained whose reflective surface has a different color and/or a different surface resistivity.

25     In particular, it is possible to provide the reflective surface on the front face of the mirror so that it has water-repellent properties.

It is also possible to select the coloring of the reflective surface of the above-described mirror according to the present invention, by appropriately combining the thicknesses of the titanium-based compound films in order to 30 achieve, for example, the coloring that corresponds to the coloring of the

body of the vehicle on which the mirror is to be installed.

In a different embodiment, the two conductive busbars 3 can be provided, as an alternative to deposition on glass, directly on said film made of an electrically conductive metallic material, so as to simplify all the 5 operations for assembly to the conductive terminals for connection to the electric power source (see Figure 4).

In this case, the conductive busbars 3 can be constituted by thin metal strips (made for example of copper, aluminum, silver, et cetera) which are applied to the metal film 2.

10 Contact can be provided by pressure or, in other cases, by fixing the conductive busbars to an adhesive film to be applied to the layer of electrically conductive metal.

15 The adhesive film, which must of course be able to withstand the operating temperatures reached during the heating step, also has a useful safety function, since in case of accidental breakage of the mirror it prevents fragments from detaching.

The conductive busbars 3 thus provided can be welded or fixed to suitable connectors in order to provide connection to the electric power supply system.

20 In practice it has been observed that the present invention effectively achieves all of the intended aim and objects.

It should be observed that the above-described mirror allows a considerable constructive simplification with respect to conventional models, since it is not necessary to insert any element in addition to the 25 reflective surface; in particular, there is no adhesive resistive film.

The above-described heated mirror according to the present invention allows, in an equal time, to defrost a much larger surface than conventional mirrors.

If the temperature reached by the mirror during operation is higher than 30 the temperature that is sufficient for defrosting, it is possible to provide the

mirror with a temperature sensor, or with a PCT as an alternative, so that the device, by acting on the conductive terminals, limits the electric power supply so that the temperature remains substantially constant at the intended value.

5 In particular, an important advantage of the present invention is that a heated mirror has been provided which is capable of ensuring optimum viewing of the reflected image and better visibility with respect to conventional types in case of strong lighting, such as for example in the presence of headlights.

10 A further important advantage of the present invention is that a heated mirror has been provided which ensures good heating uniformity on the entire surface, since the titanium film itself constitutes not only the actual reflective surface but also the resistive element that generates heat by means of the Joule effect.

15 A further advantage is that a heated mirror has been provided which can be manufactured in a shorter time than conventional models.

A further advantage is certainly that it is possible to produce a heated mirror in practice at very low costs.

20 A further advantage of the present invention is that a heated mirror has been provided whose coloring is determined by the physical characteristics of the reflective surface.

Moreover, it should be observed that the present invention also achieves the advantage of providing a heated mirror which ensures a longer life time than conventional mirrors.

25 A further advantage is that a heated mirror has been provided which is protected against degradation of the reflective surface caused by the action of weather.

30 A further advantage of the present invention is that a heated mirror has been provided which ensures good electric and optical characteristics over time.

A further advantage is that the above-described heated mirror can operate even with very low temperatures (down to -50°C) simply by varying the physical characteristics of the titanium film and without having to insert other resistive elements.

5 A further advantage is that a heated mirror has been provided which has a lighter structure than conventional models and at the same time has a greater mechanical strength, so as to reduce the risk of impact breakage.

The weight reduction and increase in mechanical strength can be achieved by means of a chemical tempering process.

10 It should also be observed that the above-described mirror can be subjected to additional treatments, such as marking or painting, all of which are per se known, so as to accordingly provide equivalent configurations.

15 It is also possible to apply to the above-described heated mirror according to the present invention a colored screen-printed paste on the front face in order to conceal the presence of the conductive busbars.

The present invention is susceptible of numerous modifications and variations, all of which are within the scope of the same inventive concept.

In one constructive configuration, for example, it is possible to coat the front face of the mirror with a titanium oxide coating having water-repellent characteristics.

Another alternative is achieved by providing a mirror according to the invention in which the reflective layer on the front face is obtained by deposition of the film made of an electrically conductive metal.

25 Moreover, the conductive reflective layer can be coated with a coating of titanium oxide with water-repellent characteristics, so that as a whole said layer is a single element with reflective, heating, water-repellent and color characteristics at the same time.

During the production process, some treatments may be swapped without altering the final characteristics of the resulting surfaces.

30 The materials employed, so long as they are compatible with the

contingent use, as well as the dimensions and the shape, may be any according to requirements.

The disclosures in Italian Patent Application No. PD98A000134 from which this application claims priority are incorporated herein by reference.

CLAIMS

1. A heated mirror, characterized in that it comprises a glass body on one face whereof a film of an electrically conductive metal is deposited so as to form an actual reflective surface, two conductive busbars being associated  
5 with said metal film and being suitable to allow the flow of an electric current in said film.
2. The mirror according to claim 1, characterized in that said glass body is a flat or curved plate.
3. The mirror according to claim 2, characterized in that said two  
10 conductive busbars are interposed between said film made of an electrically conductive metal and said glass body.
4. The mirror according to claim 1, characterized in that said two conductive busbars are formed directly on said metal film.
5. The mirror according to claim 1, characterized in that said two  
15 conductive busbars are provided by screen printing.
6. The mirror according to claim 5, characterized in that said screen-printed conductive busbars are provided by means of silver paste.
7. The mirror according to claim 4, characterized in that said conductive busbars are metal strips arranged on said film made of an electrically  
20 conductive metal.
8. The mirror according to claim 7, characterized in that said metal strips are fixed to said film by pressure.
9. The mirror according to claim 7, characterized in that said strips are fixed to an adhesive film which is adapted to be applied to said electrically  
25 conductive film.
10. The mirror according to claim 1, characterized in that said conductive busbars are connected to conductive terminals which are connected to an electric power source.
11. The mirror according to claim 10, characterized in that said conductive busbars are connected to said conductive terminals by welding.  
30

12. The mirror according to claim 11, characterized in that said conductive terminals are made of copper or silver.
13. The mirror according to claim 12, characterized in that a protective layer is applied to the face provided with said film made of an electrically conductive metal.  
5
14. The mirror according to claim 1, characterized in that said film made of an electrically conductive metal is titanium-based.
15. The mirror according to claim 1, characterized in that said film is made of pure titanium.
- 10 16. The mirror according to claim 15, characterized in that it comprises a titanium nitride film superimposed on said pure titanium film.
17. The mirror according to claim 16, characterized in that it comprises a water-repellent titanium oxide film superimposed on said pure titanium film.
- 15 18. The mirror according to claim 1, characterized in that said glass body is chemically tempered.
19. The mirror according to claim 1, characterized in that it is subjected to marking.
- 20 20. The mirror according to claim 1, characterized in that it is provided, on said metal film, with a colored screen-printing paste so as to cover said conductive busbars.
21. The mirror according to claim 10, characterized in that it comprises control means for connection/disconnection with respect to said electric power source.
- 25 22. The mirror according to claim 21, characterized in that said control means comprise a temperature sensor or a PCT.
23. The mirror according to claim 13, characterized in that said protective layer is applied at welding regions between said conductive terminals and said conductive busbars so as to prevent the generation of electrical discharges in the presence of water.
- 30 24. A method for manufacturing a heated mirror, particularly for

vehicles, which comprises the steps of:

applying by deposition, on one face of a glass body, a film made of an electrically conductive metal, so as to form a true reflective surface;  
associating two conductive busbars with said film.

5        25. The method according to claim 24, characterized in that said two conductive busbars are obtained by screen-printing directly on said face of the glass body and are interposed between said body and said film made of an electrically conductive metal.

10      26. The method according to claim 23, characterized in that said two conductive busbars, constituted by metal strips, are connected by pressing to said metal film.

15      27. The method according to claim 24, characterized in that it comprises the step of connecting, by means of an adhesive film, said two conductive busbars constituted by metal strips to said film made of an electrically conductive metal.

28. The method according to claim 24, characterized in that it comprises the step of, after the deposition of said film made of an electrically conductive metal on said face of the glass body, applying a protective layer on said face.

20      29. The method according to claim 28, characterized in that it comprises, after forming said conductive busbars by screen-printing, the step of drying a screen-printing paste, used in the screen-printing, by means of a heat treatment in order to improve adhesion to said glass body.

25      30. The method according to claim 24, characterized in that it comprises the step of welding said conductive busbars to conductive terminals which can be connected to an electric power source.

31. The method according to claim 24, characterized in that said deposition of said metal film on said face of the glass body is obtained with a method known as Vacuum Arc Deposition.

30      32. The method according to claim 25, characterized in that it comprises

the step of, after said step for welding the conductive busbars to said terminals and before the deposition of said metal film, delimiting, on said face of the glass body, the surface to be coated by masking the remaining part.

5       33. The method according to claim 28, characterized in that it comprises the step of, after the application of said protective layer, drying said protective layer.

10      34. The method according to claim 24, characterized in that it comprises the step of, after the deposition of said metal film on said face of the glass body, introducing in a deposition chamber at least one gas so as to obtain at least one other film by deposition after the first one.

35. The method according to claim 24, further comprising a chemical tempering step of said glass body.

15      36. The method according to claim 24 further comprising the step of performing a marking process.

37. The method according to claim 24, further comprising the step of applying colored screen-printing paste to said film made of electrically conductive metal in order to conceal the visibility of said conductive busbars.

1/1

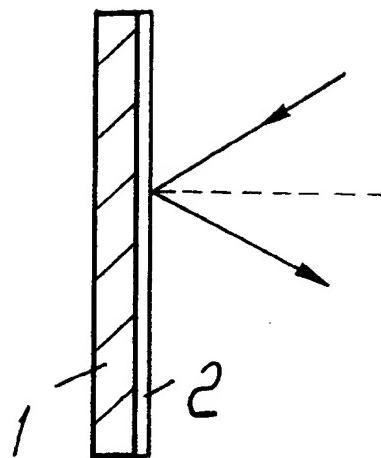


FIG. 1

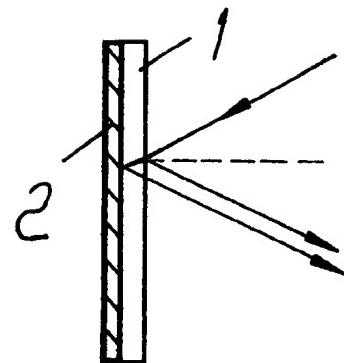


FIG. 2

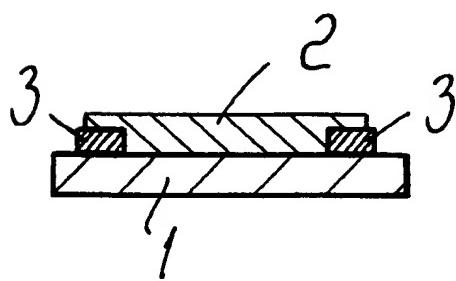


FIG. 3

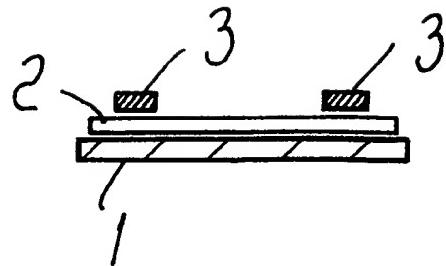


FIG. 4

**INTERNATIONAL SEARCH REPORT**

Int'l Application No  
PCT/EP 99/03627

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 H05B3/84

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 H05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 677 434 A (PENTEL) 18 October 1995 (1995-10-18)	1,2,4-7, 10-16, 24,26, 30,31 34
Y	abstract page 4, line 41 - line 44 page 6, line 5 - line 27 page 8, line 19 - line 23 page 12, line 46 - page 13, line 8 page 15, line 34 - line 37 page 18, line 18 - line 24 page 21, line 29 - line 31 page 22, line 33 - line 35 page 22, line 53 - line 56; claim 1	
A		3,8,9, 17-23, 25, 27-29, 32,33, 35-37 -/-
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C.		<input checked="" type="checkbox"/> Patent family members are listed in annex.

Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

- 12 August 1999

18/08/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl  
Fax: (+31-70) 340-3016

Authorized officer

Taccoen, J-F

**INTERNATIONAL SEARCH REPORT**International Application No  
PCT/EP 99/03627

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3 790 748 A (VAN LAETHEM) 5 February 1974 (1974-02-05) abstract -----	34
A	EP 0 388 988 A (MURAKAMI KAIMEDO) 26 September 1990 (1990-09-26) abstract -----	17

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No	
PCT/EP 99/03627	

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP 0677434	A 18-10-1995	JP 7156758 A JP 7223514 A JP 7257328 A JP 7277151 A JP 7277152 A JP 8053050 A JP 8058534 A JP 8080817 A WO 9512508 A		20-06-1995 22-08-1995 09-10-1995 24-10-1995 24-10-1995 27-02-1996 05-03-1996 26-03-1996 11-05-1995
US 3790748	A 05-02-1974	GB 1391425 A AT 327343 B AT 496472 A BE 784185 A CA 981319 A CH 558123 A DE 2227712 A FR 2140415 A IE 36459 B IT 965098 B NL 7207822 A		23-04-1975 26-01-1976 15-04-1975 30-11-1972 06-01-1976 15-01-1975 21-12-1972 19-01-1973 10-11-1976 31-01-1974 12-12-1972
EP 0388988	A 26-09-1990	DE 69002495 T US 5155625 A		13-01-1994 13-10-1992

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- BLACK BORDERS**
- IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- FADED TEXT OR DRAWING**
- BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- SKEWED/SLANTED IMAGES**
- COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- GRAY SCALE DOCUMENTS**
- LINES OR MARKS ON ORIGINAL DOCUMENT**
- REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**